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Date of Filing : 16 MAY 2003 ✓

Application Number : PCT/SG03/00133 [withdrawn] ✓

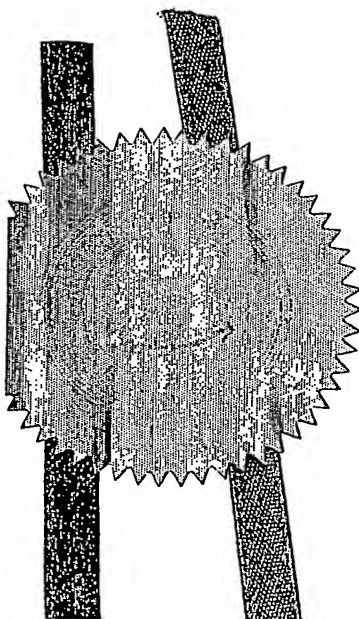
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Title of Invention : IRON WITH CARTRIDGE



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PSG030438WOP

0	For receiving Office use only	
0-1	International Application No.	PCT/SG03 / 00133
0-2	International Filing Date	16 MAY 2003 (16-05-03)
0-3	Name of receiving Office and "PCT International Application"	REGISTRY OF PATENTS (SINGAPORE) PCT INTERNATIONAL APPLICATION
0-4	Form - PCT/RO/101 PCT Request	
0-4-1	Prepared using	PCT-EASY Version 2.92 (updated 01.04.2003)
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	Intellectual Property Office of Singapore (RO/SG)
0-7	Applicant's or agent's file reference	PSG030438WOP
I	Title of invention	IRON WITH CARTRIDGE
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III-1-11	Applicant's registration No. with the Office	GPA 02/0007
V	Designation of States	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	EP: AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE TR and any other State which is a Contracting State of the European Patent Convention and of the PCT (except BG CZ EE HU RO SI SK)
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	SG
V-5	Precautionary Designation-Statement  In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.	
V-6	Exclusion(s) from precautionary designations	NONE
VI	Priority claim	NONE
VII-1	International Searching Authority Chosen	European Patent Office (EPO) (ISA/EP)

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VIII	Declarations	Number of declarations	
VIII-1	Declaration as to the identity of the inventor	-	
VIII-2	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent	-	
VIII-3	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application	-	
VIII-4	Declaration of inventorship (only for the purposes of the designation of the United States of America)	-	
VIII-5	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty	-	
IX	Check list	number of sheets	
IX-1	Request (including declaration sheets)	4	electronic file(s) attached
IX-2	Description	4	-
IX-3	Claims	2	-
IX-4	Abstract	1	-
IX-5	Drawings	2	EZABST00.TXT
IX-7	TOTAL	13	-
IX-8	Accompanying items	paper document(s) attached	electronic file(s) attached
IX-11	Fee calculation sheet	✓	-
IX-17	Copy of general power of attorney	reference no.	-
IX-19	PCT-EASY diskette	-	Diskette
IX-20	Figure of the drawings which should accompany the abstract	1	
X	Language of filing of the international application	English	
X-1	Signature of applicant, agent or common representative		
X-2	Name (LAST, First)	VAN DER VEER, Johannis, L.	
X-3	Capacity	(Authorized Representative)	

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10-1	Date of actual receipt of the purported international application	16 MAY 2003 (16-05-03)
10-2	Drawings:	
10-2-1	Received	
10-2-2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/EP

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10-6	Transmittal of search copy delayed until search fee is paid	
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Iron with cartridge

The invention relates to an iron comprising: a cartridge for containing a liquid, a nozzle means having at least one aperture, a pump means for delivering said liquid to the nozzle means, said cartridge comprising an outer wall with vent means including a vent hole for ventilating said cartridge.

5 The invention also relates to a cartridge suitable for use in an iron as described above.

Such an iron is known from US-B2-6425197. Ventilating a cartridge is  
10 necessary to avoid arising of under-atmospheric pressure inside the cartridge during the spraying operation. When the pump sucks liquid from the cartridge air is sucked in the cartridge through the vent hole thereby keeping the cartridge at atmospheric pressure. A bad ventilation may result in irregular spraying and thus in a not uniform moistening of the garment to be ironed. A problem of vent means is that during ironing operation liquid often  
15 leaks through the vent hole and soils the housing of the iron and the hand(s) of the user. This of course is undesired, in particular when the liquid is an additive that comprises siloxanes. In particular, spilling of liquid through the vent hole occurs when the iron is put in its so-called heel position, which is a position in which the soleplate of an iron is oriented in a substantially vertical direction. But also in a horizontal position of the iron spilling of liquid  
20 should be prevented as much as possible. To prevent such liquid spillage it is possible to provide the hole with a one-way valve or to cover the hole with a certain material, such as Goretex™, that enables air to pass the material in one direction and prevents liquid to pass the material in the other direction. However, the disadvantage of these solutions is that as time goes by the one-way valve or such a material will become soiled and clogged up thus  
25 not properly function anymore.

It is an object of the invention to provide the cartridge of an iron with vent means that prevent soiling of the iron due to any spillage of liquid through the vent hole.

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According to the invention, this object is achieved in that the vent means comprises a storage chamber for receiving an excess of liquid from the cartridge through said vent hole, said storage chamber being open to the open air.

If the level of the liquid in the cartridge is above the vent hole, liquid can leak through the vent hole into the storage chamber. However, only a small amount of liquid will flow through the vent hole because, as soon as liquid pours out the cartridge, an under-atmospheric pressure arises inside the cartridge so that a further outward flow of liquid is prevented. This results in a pressure balance. The storage chamber prevents a spillage of liquid and hence soiling of the iron. As pressure balance will occur quickly, the storage chamber can be kept small-sized. As soon as the liquid level reaches a position below the vent hole, for instance because the user puts the iron in another position such as from the heel position to the usual, horizontal ironing position, the excess of liquid in the storage chamber flows back into the cartridge. Also when the user starts the pump (electric or hand) for spraying operations, the excess of liquid flows back into the cartridge.

A preferred embodiment of the iron is characterized in that an end wall of the storage chamber that faces the inside of the cartridge comprises said vent hole. This ensures a quick and complete emptying of the storage chamber.

Another preferred embodiment of the iron is characterized in that the storage chamber extends from the outer wall toward the inside of the cartridge. In this way the storage chamber or a part thereof does not form an inconvenient extension which extends outwards from the outer wall of the cartridge.

To prevent clogging of the vent hole and to ensure a sufficient venting, the size of the vent hole should be not too small. Therefore, a further embodiment of the iron is characterized in that the cross-sectional area of the vent hole is greater than  $0.03 \text{ mm}^2$ .

To prevent spilling of liquid through the vent hole, in particular when moving the iron during the ironing process and the cartridge is full, the size of the vent hole should be not too large. Therefore, a further embodiment of the iron is characterized in that the cross-sectional area of the vent hole is less than  $3 \text{ mm}^2$ .

A further preferred embodiment of the iron is characterized in that the volume of the storage chamber is at least 1% of the volume of the cartridge. At least 1% would be enough to ensure that due to expansion of air trapped in the cartridge no spillage of liquid occurs. Preferably the volume of the storage chamber is at least  $30 \text{ mm}^3$ .

A further preferred embodiment of the iron is characterized in that the vent hole has a diameter  $D_a$  greater than 0.4 mm and less than 1.2 mm, and that the storage

chamber is a tube, an inner diameter  $D_t$  thereof being greater than 2.5 mm and less than 5.5 mm, a length  $L$  of the tube being at least 25 mm.

An alternative embodiment of the iron is characterized in that the storage chamber is a tube with open ends at both sides, an inner diameter  $D_t$  of the tube being less than 3 mm, and a length  $L$  being at least 10 mm.

These and other aspects of the invention will be apparent from and elucidated with reference to the embodiment described hereinafter.

In the drawings:

Fig.1 is a diagrammatic cross-sectional view of an iron with a cartridge wherein the iron is in its operating position, and

Fig.2 is a diagrammatic cross-sectional view of an iron with a cartridge of fig.1 wherein the iron is in its heel rest position.

An iron according to the invention as shown in Figs.1 comprises a housing 1, a sole plate 2, a heating element 3 for heating the sole plate, an exchangeable reservoir 4 for containing a liquid 5, and a spraying nozzle means 6. The exchangeable reservoir 4 may be a kind of cassette or cartridge 4 with a hard synthetic resin housing. The liquid 5 in the cartridge may be a so-called additive liquid which can be used, for example, to improve the wrinkle resistance of the garment or for easier gliding of the soleplate over the garment. The bottom 7 of the cartridge 4 is provided with an outlet 8 for the liquid 5. A coupling piece 9 is connected at the lowerside of the bottom 7, which coupling piece has a duct 10 of which an inlet is in communication with the outlet 8 of the cartridge 4 and of which an outlet terminates in an outlet tube 11. The coupling piece 9 may be integral with the cartridge 4. The iron comprises a delivery system 12 for delivering the liquid 5 from the cartridge 4 to the nozzle means 6 in order for it to be sprayed on the cloth to be ironed. The delivery system comprises a first channel 13, an outlet thereof being connected to an inlet of an electric pump 14 arranged inside the housing of the iron, and a second channel 15, an inlet thereof being connected to an outlet of the pump 14. An inlet of the channel 13 is provided with a coupling sleeve 16 for coupling to the outlet tube 11 of the coupling piece 9. An outlet of the second channel 15 is provided with a coupling sleeve 17. The cartridge 4 is provided with the nozzle means 6. The nozzle means comprises a nozzle tube 18 terminating in a nozzle 19 having an



aperture 20. An inlet of the nozzle tube forms a coupling tube 21 for coupling to the coupling sleeve 17 of the second channel 15. The cartridge 4 can be inserted into a cavity 22 of the iron. When an additive spray is desired, the user starts the pump 14 by pressing a knob 24. The pump sucks the additive liquid 5 from the cartridge 4 into the channel 13 and pumps it via the channel 15 and the nozzle tube 18 towards the nozzle 19.

The cartridge 4 is provided with vent means 25 for ventilating the cartridge. The vent means comprises a storage chamber 26. An end wall 27 of the storage chamber that faces the inside of the cartridge has a vent hole 28. In this embodiment the entire storage chamber extends from an outer wall 29 of the cartridge toward the inside of the cartridge. But a part of the storage chamber 26 may also protrude toward the outside of the cartridge as indicated with dashed lines in the encircled enlarged view of the vent means 25. However, for esthetic reasons as well as for convenient handling of the cartridge it is preferred that the entire storage chamber 26 extends inside the cartridge 4. The storage chamber may be shaped as a round tube but may also have other shapes, such as a square shape. In a preferred embodiment the storage chamber has the shape of a tube 30 whereby the diameter  $D_a$  of the vent hole 28 is between 0.4 mm and 1.2 mm, the inner diameter  $D_t$  of the tube 30 is between 2.5 mm and 5.5 mm, and the length  $L$  of the tube 30 is at least 25 mm. With these dimensions at the one hand spilling of liquid 5 is prevented whereas at the other hand clogging of the vent hole 28 will not occur. If the liquid level 31 in the cartridge 4 is above the vent hole 28, the static pressure pushed some liquid through the vent hole 28 into the storage chamber 26. This causes an underpressure in the cartridge until a pressure balance is reached. Only a small amount of liquid passes the vent hole 28 and enters the storage chamber 26. Withdrawing liquid from the cartridge during operation causes an increase of the underpressure in the cartridge so that air from the outside and any excess of liquid in the storage chamber 26 is sucked into the cartridge 4 through the vent hole 28. It will be clear that when the iron is put in its heel position as shown in Fig.2 also no liquid will leak out the storage chamber.

In an alternative embodiment which is not shown, the storage chamber can be a tube open at both ends whereby the diameter  $D_a = D_t$ . Preferably  $D_t$  is less than 3 mm and the length  $L$  of the tube is at least 10 mm.

If the liquid is an additive liquid in a concentrated form, it can be diluted with water from a water reservoir of the iron as described in the second embodiment of WO-A-02/002859.

## CLAIMS:

1. Iron comprising a cartridge (4) for containing a liquid (5), a nozzle means (6) having at least one aperture (20), a pump means (14) for delivering said liquid to the nozzle means, said cartridge (4) comprising an outer wall (29) with vent means (25) including a vent hole (28) for ventilating said cartridge, characterized in that the vent means (25) comprises a storage chamber (26) for receiving an excess of liquid (5) from the cartridge (4) through said vent hole (28), said storage chamber being open to the open air.
2. Iron as claimed in claim 1, characterized in that an end wall (27) of the storage chamber (26) that faces the inside of the cartridge (4) comprises said vent hole (28).
3. Iron as claimed in claim 1 or 2, characterized in that at least a major part of the storage chamber (26) extends from said outer wall (29) of the cartridge (4) toward the inside of the cartridge.
4. Iron as claimed in any one of the claims 1 to 3, characterized in that the cross-sectional area of the vent hole (28) is greater than  $0.03 \text{ mm}^2$ .
5. Iron as claimed in any one of the claims 1 to 4, characterized in that the cross-sectional area of the vent hole (28) is less than  $3 \text{ mm}^2$ .
6. Iron as claimed in any one of the claims 1 to 5, characterized in that the volume of the storage chamber (26) is at least  $30 \text{ mm}^3$ .
7. Iron as claimed in claim 6, characterized in that the volume of the storage chamber (26) is at least 1% of the volume of the cartridge (4).
8. Iron as claimed in claim 1 or 2, characterized in that the vent hole (28) has a diameter  $D_a$  greater than 0.4 mm and less than 1.2 mm, and that the storage chamber (26) is a

tube (30), an inner diameter  $D_t$  thereof being greater than 2.5 mm and less than 5.5 mm, a length  $L$  of the tube being at least 25 mm.

9. Iron as claimed in claim 1 or 2, characterized in that the storage chamber (26)  
5 is a tube with open ends at both sides, an inner diameter  $D_t$  of the tube being less than 3 mm, and a length  $L$  being at least 10 mm.
10. Cartridge (4) as claimed in any one of the preceding claims.

## ABSTRACT:

The invention relates to an iron comprising a cartridge (4) for containing a liquid (5), a nozzle means (6) having at least one aperture (20), a pump means (14) for delivering said liquid to the nozzle means, said cartridge (4) comprising an outer wall (29) with vent means (25) including a vent hole (28) for ventilating said cartridge (4). To prevent  
5 soiling of the iron due to spillage of liquid (5) through the vent hole (28) said vent means (25) comprises a storage chamber (26) for receiving an excess of liquid from the cartridge.

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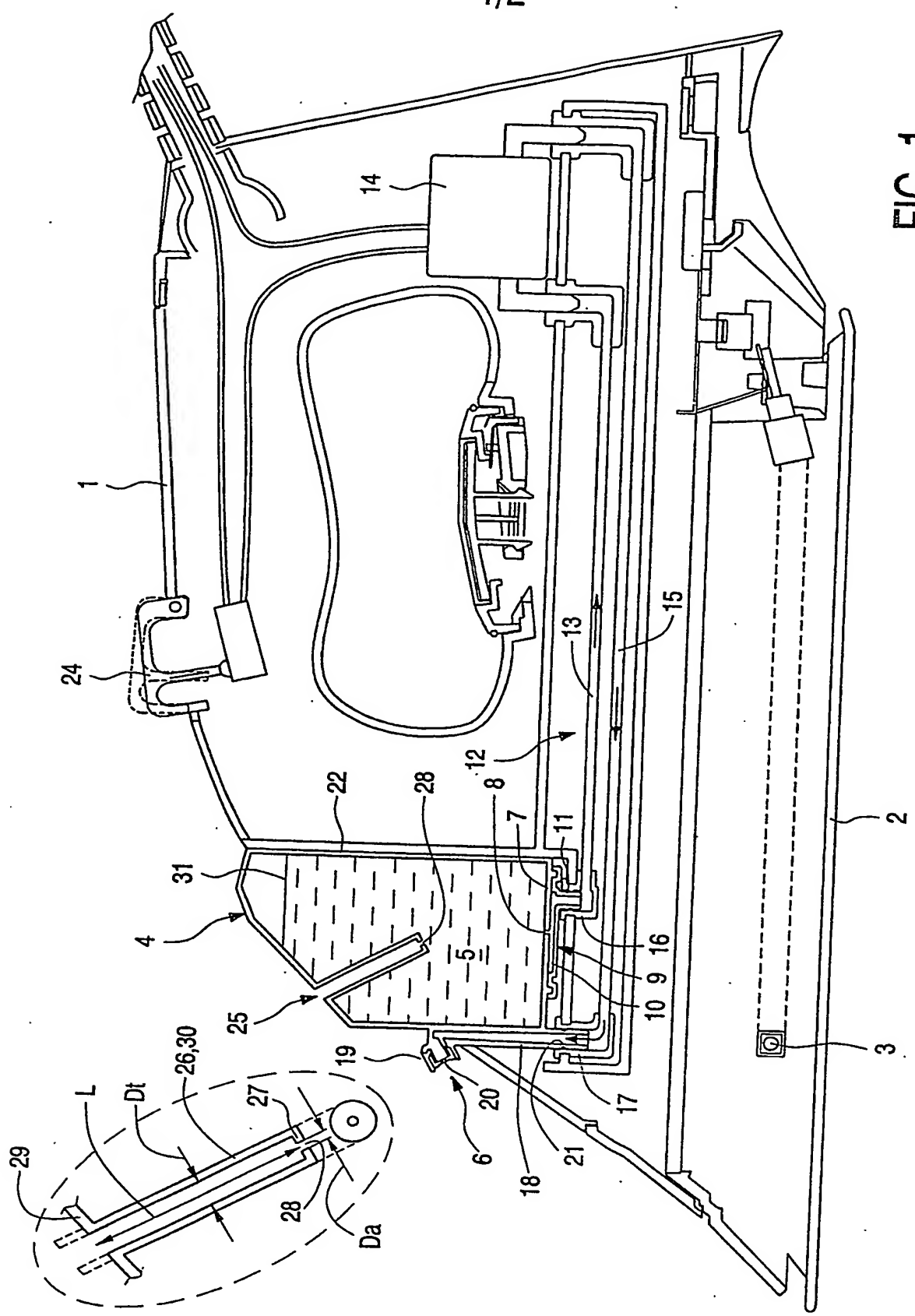


FIG. 1

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FIG. 2

